

Tree Canopy Assessment

CITY OF MEDINA

Prepared for:



Incorporated 1955
MEDINA
Washington

Attn: Robert Grumbach
P.O. Box 144
Medina, WA 98039



Medina Elementary 2014

Prepared by:



THE
WATERSHED
COMPANY

750 Sixth Street South
Kirkland . WA 98033

p 425.822.5242
f 425.827.8136
watershedco.com

Printed on 30% recycled paper

Tree Canopy Assessment for the City of Medina

August 2014.

The Watershed Company Reference Number: 140513

Project Staff:

Grace Bergman, GIS Analyst/Landscape Designer

Mike Foster, ISA Certified Arborist®/ Ecologist

Cite this document as Medina Tree Canopy Assessment

Table of Contents

	Page #
1 Introduction.....	1
2 Methodology	2
3 Findings.....	6
4 Discussion.....	8
5 2002 Medina Tree Inventory Report.....	11
6 Reference	12

List of Figures

Figure 1. Study area is landward of the city boundary as shown in green.

Figure 2. Example of 30x30 meter grid overlay used in coverage classification.

List of Tables

Table 1 – Categories of trees with examples that make up the urban tree canopy in the City of Medina.

Table 2 – 2012 Tree Canopy Inside City Boundaries

Table 3 – 2012 Tree Canopy Inside City Boundaries Excluding SR 520 right-of-way

Table 4 – 2012 by Land Use Categories

Table 5 – 2001 NLCD Tree Canopy Inside City Boundaries

Table 6 – 2001 NLCD Tree Canopy inside City Boundaries Excluding SR 520 right-of-way

Table 7 - Examples of typical tree heights within the City of Medina.

Appendices

1 Introduction

The City of Medina's tree code calls for the preservation of significant trees by using tree replacement mitigation as the primary tool to implement policy. Trees contribute significantly to the community's goal of maintaining a natural, low-density residential and informal appearance. Trees can be a polarizing subject. Whether they are growing singly, in clusters or in woodland settings, they provide a wide variety of psychological and tangible benefits, but they can block views and access to sunlight, which have their own tangible benefits.



In 2012, the City Council directed an effort to review and update the Medina Tree Code. Work on the tree code updates started in early 2014 and proceeded with the adoption of Ordinance No. 909, which included housekeeping and moderate revisions not involving policy changes. The update then continued with consideration given to possibly more significant changes reflective of still to be determined shifting community values. This continued effort to update the tree code started in June and included gathering inventory data of trees in the community.



The Watershed Company, in partnership with the City, developed an efficient and repeatable method for measuring the canopy cover using GIS remote sensing technology to estimate the city's total canopy coverage and composition using high-resolution orthoimagery. This method provides a cost effective, timesaving means of inventorying the *entire* community. The objective for conducting the inventory is to provide meaningful information supporting general policy direction discussions. The GIS remote sensing technology and high-resolution

orthoimagery is easily replicable and allows us to track canopy changes through time, which in turn helps staff and the community evaluate measures to achieve meeting established goals pertaining to trees in the community.

2 Methodology

The purpose of this study is to assess the tree canopy coverage in Medina to: (1) set an overall baseline measurement of the tree canopy in the City; (2) distinguish between two canopy types (i.e., broadleaf versus coniferous as shown in Table 1); and (3) allow for tracking of canopy coverage changes over time.

Table 1: Categories of trees with examples that make up the urban tree canopy in the City of Medina.

	Evergreen	Deciduous
Broadleaf	Pacific madrone, southern magnolia, English holly	Big leaf maple, red alder, ginkgo biloba
Conifer	Douglas-fir, western red-cedar, western hemlock, Ponderosa pine	Western larch, dawn redwood

Several methodologies were considered for analyzing the area and makeup of the canopy in the City. The objective of the inventory was to develop an accurate and repeatable method of measuring urban tree canopy that is suitable for the scale and land-cover characteristics of the study area. Color-infrared and multi-spectral imagery analysis has been used to rapidly calculate canopy cover in larger and highly urbanized cities like New York and Seattle (Grove, O'Neil-Dunne, Pelletier, Nowak, & Walton, 2006). However, these methods do not easily distinguish between tree types in suburban landscapes with mixed species and age, and overlapping tree stands, and are somewhat costly. Aerial orthoimagery analysis paired with ground-truthing has been used in Portland and, in a more recent study, Seattle (Ciecko, Tenneson, Dilley, & Wolf, 2012). The method of collecting preliminary canopy cover data through "heads-up digitization"¹ allows analysts to quantify and qualify complete citywide canopy efficiently according to the parameters of the study. Further, the abundance of recent and historical geo-referenced aerial imagery enables coverage comparisons using the same assessment framework and classification. Digitized data was then selectively ground-truthed by an ISA Certified Arborist.

2.1 STUDY AREA

All land areas inside the jurisdictional boundaries of the City were considered for this study (see Figure 1). Due to the size of the city and quality of the orthoimagery, 100 percent of the land area was reviewed and analyzed using a heads-up digitalization method.

¹Manual digitization by tracing a mouse over features displayed on a computer monitor, used as a method of vectorizing raster data.

Figure 1: Study area is landward of the city boundary as shown in green.



2.2 STUDY DESIGN

2.2.1 CURRENT BASELINE CONDITION:

To capture tree canopy data from the orthoimagery, GIS analysts used ESRI® ArcGIS application to view and estimate visible canopy on computer screens. King County produced the orthoimagery at 0.25-foot resolution from data gathered in the spring of 2012. The resolution and clarity of the imagery were sufficient to depict canopy size of trees and to distinguish composition of deciduous communities before their leafing-out.

To ensure a consistent evaluation, we divided the study area into uniform 30x30 meter square assessment units. Each 30-meter square grid² was visually analyzed at a minimum 1 to 500 scale for present canopy coverage by type (i.e., evergreen vs. deciduous). Orthoimagery at this scale is sufficient to be visually inspected for both stands of trees and individual trees at various age, height, and species.

²Assessment grids covering area along the city boundary were trimmed to include only the incorporated area and do not have standard sizing.

- Where tree canopy overlapped between evergreen and deciduous species types, the GIS analysts estimated a separation line so that no double counting of the tree canopy occurred.
- Areas of hard surfaces, open water, structures, bare ground, lawn, small shrubs, and small manicured landscape trees were excluded from the counting of tree canopy. The small manicured landscape trees are primarily topiary trees – rows of evergreen trees trimmed in the shape of a hedge such as Leyland cypress or Portuguese/ English laurel.

The GIS analysts tagged grids containing area obstructed by sun shadow or orthoimagery post-processing distortion for follow-up. A total of 4,263 square grids were analyzed of which 147 square grids were identified requiring follow-up field verification by an ISA Certified Arborist. Of the 147 square grids, 99 of them were accessible from public streets and parking areas. These grid sites were visited by the arborist and a GIS analyst who clarified discrepancies in the orthoimagery. The remaining 48 grids were not accessible by the arborist or GIS analyst due to trees being located on private properties or due to fences or other barriers. These square grids were re-analyzed by a different GIS analyst using the same orthoimagery and the results from the second analysis were compared with the original analysis to produce a conclusion.

Once canopy coverage and composition data were revised based on field input and secondary analysis, individual square grid values are multiplied by respective square grid area and summed to provide the City total canopy area by type.

2.2.2 LIMITATIONS OF CURRENT BASELINE ANALYSIS:

As with any remote sensing and rapid assessment method, a margin of error exists due to data limitations and interpretation. Some detail is lost through rounding data to the size class (as shown in Figure 2). It should be noted that since a sampling method was not employed, no regression modeling was run to determine a numeric margin of error. One sampling year was assessed for this study. Shadows cast from tall objects including tall conifers due to the angle of the sun at the time the image was taken obscures some of the data. Although the field inspection has verified most of the areas in question, grids that are inaccessible, such as those located away from public areas or on private property, were not rectified in the field.

Additionally, the analysis was performed two years after the flight date of the orthoimagery by King County, thus discrepancies between current conditions and those depicted in the orthoimagery, such as vegetation pruning or removal, should allow for some error.

Figure 2: Example of 30x30 meter square grid overlay used in coverage classification.



2.2.3 2001 MEASUREMENT OF TREE CANOPY:

The 2001 tree canopy analysis was conducted using the “National Land Cover Database Zone 01 Tree Canopy Layer” (NLCD) created by a consortium of federal agencies including the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), the U.S. Forest Service (USFS), the National Park Service (NPS), the U.S. Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM) and the USDA Natural Resources Conservation Service (NRCS). NLCD analysis captured thermal signatures of tree canopies by zones (Zone 01 is western Washington State) using Landsat 7 imagery at 30-meter unit. A percentage of the preliminary data was validated using 1-meter orthoimagery. Based on the margin of error produced by the 1-meter validation, a regression model was run to validate the assessment. Classification accuracy is estimated at 84.3 – 86.4 percent (NLCD publication).

The geographical boundaries of the City of Medina require evaluation of ten 30-meter units. Each unit has its own values so the summarization of that data in this study is representative of Medina.

2.2.4 LIMITATIONS OF NLCD:

Limitations of the 2001 tree canopy analysis can be found at the Multi-Resolution Land Characteristic Consortium website at <http://www.mrlc.gov/mrlc2k.asp>.

3 Findings

3.1 CURRENT ASSESSMENT

In sum, the City contains 287.72 acres +/- of tree canopy in April 2012. That is 31.9 percent of the total land area mapped by GIS. Of the total tree canopy, 52.5 percent was determined to be coniferous evergreen tree coverage consisting mostly of native Douglas-fir, western red-cedar and to a lesser extent some western hemlock and non-native to Puget Sound redwood, Deodar cedar, Atlas cedar, and Leyland cypress.

The remaining 47.5 percent of the tree canopy is either deciduous or broadleaf evergreen in composition. Deciduous tree taxa in the city are much more diverse than the evergreen conifers. Some of the recurring deciduous tree species include the southern magnolia, bigleaf maple, red maple, Norway maple, European birch, red alder, landscape cherry trees, sweetgum and so on. The tables below summarize the results.

Table 2: 2012 Tree Canopy Inside City Boundaries

SUMMARY	ACRES	PERCENT
Land Area	902.13	100.0%
Evergreen Canopy	150.99	16.7%
Deciduous Canopy	136.73	15.2%
Total	287.72	31.9%

Table 3: 2012 Tree Canopy Inside City Boundaries Excluding SR 520 right-of-way

SUMMARY	ACRES	PERCENT
Land Area	887.59	100.0%
Evergreen Canopy	149.98	16.9%
Deciduous Canopy	135.97	15.3%
Total	285.95	32.2%

General land use shows a larger disparity across categories than is observed with canopy type. Some of this is expected, as some uses are not conducive to more trees. Those areas classified as City parkland have the highest tree canopy coverage at 42.6 percent – noting the forested areas at Fairweather and the wetland-wooded areas on the south side of Medina Park. The thinnest tree canopy coverage occurs along the SR-520 corridor at 12.2 percent. Tree canopy coverage for schools, the golf course, and retail are well below the citywide average at 14.9 percent, 15.2 percent, and 24.8 percent, respectively. Total area, tree canopy acres, and the percentage of tree canopy for each general land use category are shown in the tables below.

Table 4: 2012 by Land Use Categories

SUMMARY	LAND ACRES	TOTAL CANOPY ACRES	PERCENT
Total City	902.13	287.72	31.9%
SR-520 Canopy	14.55	1.78	12.2%
Golf Course Canopy	130.44	19.84	15.2%
City Parks Canopy	29.35	12.50	42.6%
Schools Canopy	21.83	3.25	14.9%
Retail (Green Store/ Gas Station)	6.19	1.54	24.8%
All Other Areas (Residential, PSE Roads)	699.77	248.82	35.6%

3.2 2001 ASSESSMENT

As noted in chapter 1, one of the goals of this inventory is to track changes in canopy coverage over time. In response to tree clearing caused by new development, significant amendments to the Medina Tree Code were adopted in 2000, 2003 and 2006. To assess how the tree canopy today compares to the conditions at the time of these amendments, 2001 data was reviewed. The tables below summarize the results.

Table 5: 2001 NLCD Tree Canopy Inside City Boundaries

SUMMARY	ACRES	PERCENT
Land Area	902.13	100.0%
Total Tree Canopy	323.69	35.9%

Table 6: 2001 NLCD Tree Canopy inside City Boundaries Excluding SR 520 right-of-way

SUMMARY	ACRES	PERCENT
Land Area	890.68	100.0%
Total Tree Canopy	321.04	36.0%

3.3 CANOPY CHARACTERISTICS AND CONDITIONS

Tree canopies come in all forms. Some tree canopies are tall and complex with sub-canopy and understory strata. Much of the City tree canopy, however, is composed of individual landscape trees or large retained individual trees from past stands.

The City's tree canopy is as diverse in its structure as it is in its biological variety. Tall stands of trees with developed sub-canopies and understory layers characterize some of the parks and parcels within the City (see Table 2). Other parts of the urban tree canopy are formed by singular trees contained in parking lots or within planting strips along avenues. Much of the tree canopy, especially in the single-family residential areas, is a mix of tall, medium and shorter landscape species. Many of the tall conifer trees are likely remnant stands or individual trees that have been preserved.

Table 7: Examples of typical tree heights within the City of Medina

Strata	Tree Height	Species
Tall stratum	100 to 200 feet	Douglas-fir, black cottonwood, giant sequoia
Medium stratum	50 to 100 feet	Deodar cedar, big leaf maple, red maple
Low stratum	15 to 50 feet	Domesticated fruit trees, cascara, southern magnolia

4 Discussion

4.1 MEDINA COMPREHENSIVE PLAN

The Chapter 3: Community Design Element of the Comprehensive Plan discusses trees in-depth as a design characteristic of the community. The chapter states:

“The quality of Medina's neighborhood development is distinct and enhanced by a combination of natural and built features, including:

- proximity of the lake shore,
- views,
- narrow streets with extensive mature landscaping, and
- large tracts of public and private open space that can be seen from residential lots and City streets.

Trees and vegetation help reduce the impact of development, by providing significant aesthetic and environmental benefits. Trees and other forms of landscaping improve air quality, water quality, and soil stability. They provide limited wildlife habitat and reduce stress associated with urban life by providing visual and noise barriers between the City's streets and private property and between neighboring properties. They also have great aesthetic value and significant landscaping, including mature trees, is always associated with well-designed communities.

It is important that citizens be sensitive to the impact that altering or placing trees may have on neighboring properties. Trees can disrupt existing and potential views and access to sun. Residents are urged to consult with the City and with their neighbors on both removal and replacement of trees and tree groupings. This will help to protect views and to prevent potential problems (e.g., removal of an important tree or planting a living fence). Clear cutting should not be permitted on a property prior to development.”

Furthermore, the comprehensive plan contains design characteristics of a landscape plan that states the following:

“The Medina Landscape Plan lists landscaping alternatives to perpetuate the informal, natural appearance of Medina’s street rights-of-way, public areas, and the adjacent portions of private property. The Landscape Plan provides the overall framework for the improvement goals and should be reviewed periodically and updated where appropriate. This plan should be used to create landscaping arrangements, which meet the following goals:

- provide a diversity of plant species;
- screen development from City streets and from neighboring properties;
- respect the scale and nature of plantings in the immediate vicinity;
- recognize restrictions imposed by overhead wires, sidewalks, and street intersections;
- recognize “historical” view corridors; and
- maintain the City’s informal, natural appearance.

4.2 TREE CANOPY COMPARISONS

According to studies conducted by the United States Department of Agriculture Forest Department (USDA), an estimated 35.1 percent of land areas classified as urban in the United States contain tree coverage (USDA Report NRS-62, June 2010). The coverage includes all publicly and privately owned trees within an urban area – including individual trees along streets and backyards, as well as standards of remnant forest (Norwak 2001, USDA Report). The City of Medina, in 2001 had 35.9 percent tree coverage (including SR 520), which was slightly above the national estimate. However, in 2012, Medina’s tree coverage was 31.9 percent, which is below the estimated national average.

The following summarizes the tree canopy coverage³ gathered on other Washington State communities and shows where Medina’s tree canopy in 2012 compares.

Hunts Point	57% (2010)
Winslow, Bainbridge Island	42.0% (2006)
Mercer Island	41.0% (2006)
Covington	37.0% (2012)
Bellevue	36.0% (2006)
Kirkland	36.0% (2006)
Medina	31.9% (2012)
Shoreline	31.0% (2006)
Renton	28.6% (2006)
Seattle	27% (2006)

Sources: <http://friends.urbanforest.org/Washington-state-tree-ordinances/>
<http://www.mrsc.org/subjects/environment/trees.aspx>

³The method used to determine tree canopy coverage could vary by jurisdiction.

4.2.1 TREE CANOPY GOALS

While there appears to be no national recommended goals for urban tree canopies, the Society of American Foresters has recommended for cities east of the Mississippi River tree canopy goals of 40 percent overall and 50 percent for suburban residential. Several cities in Washington State have adopted tree canopy goals summarized as follows:

Hunts Point:	60%
Winslow	35.0%
Bellevue	40.0% citywide, 50% suburban residential
Kirkland	40.0%
Seattle	30.0%

4.3 MEDINA'S TREE CANOPY

In reviewing the findings, between 2001 and 2012, the City lost about 36 acres of tree canopy coverage or 3.99 percent. If we exclude the SR 520 right-of-way, the loss is about 35 acres or 3.8 percent. The loss of coverage occurred despite the significant disincentives for removing larger trees in the tree code. There are likely multiple factors affecting tree canopy coverage in the city.

At the top of this list is re-development. From the beginning of 2004 through the end of 2012, about 104 building permits for new single-family homes were issued. Since the City is built-out with few empty buildable lots, the trend towards re-development is to demolish the existing home and replacing it with a larger home. This trend towards larger homes has been supported by changes in the zoning code such as the 2008 amendment that went from using net land area to gross land area to calculate the limits on structural coverage. If an average Medina lot size of 20,989 square feet is applied, an estimated 50.11 acres of residential properties were involved in redevelopment during this period. It should be noted that re-development is where the majority of tree removal permits are also required.

Other possible contributing factors could be gaps in the tree code regulations themselves. For example:

- Trees located within a building footprint that are less than 36 inches in diameter breast height are exempt from replacement requirements. This means re-development is increasingly replacing green space with hardscape with no accounting for this loss.
- After replacement trees are planted, the replacement trees are required to be preserved only for two years afterward. This means years three and onward, until the tree reaches 20 inches diameter breast height, there are no requirements to preserve the tree.

- The 20-inch diameter breast height threshold means many tree removals are not required to be mitigated through replanting. A Douglas-fir tree with a 20-inch diameter breast height is about 60 to 80 years old. (Note: forest trees tend to grow thinner than urban trees, but urban conditions such as inadequate soils, damage and topping can slow the growth rate down of a tree.)
- The Medina significant tree species list contains only six deciduous trees as significant tree species deserving mitigation for removal for those trees reaching the size to be designated a significant tree. There are at least eleven other deciduous tree species native to the Puget Sound region that are not required to be preserved because they are not on the list. Yet, the city's tree canopy coverage is about 47 percent deciduous.
- Many of the deciduous tree species on the significant tree species list, such as the Pacific Dogwood, the Vine Maple or the Western Hazelnut do not reach a significant size in an urban residential context and therefore do not meet the requirements for when removal would trigger requirements for mitigation.
- Further contributing to the deciduous tree species limitations is the fact that the availability of 3-inch caliper deciduous trees is primarily limited to the Vine Maples and Pacific Dogwood along with similar variations. Replacement trees such as the hazelnut, native cherry or Oregon ash are not regularly available in 3-inch caliper and therefore are rarely replanted for mitigation purposes.

5 2002 Tree Inventory Report

In 2002, the city conducted a tree inventory of significant trees 24 inches in diameter and greater on both public and private property. The study area covered properties north of SR 520 and totaled 111 properties (about 10 percent of the city lots). The inventory was conducted using a different method than contained in this report. After providing notice, data collectors went to the field and conducted physical inventories of individual properties. The data collectors identified the targeted trees and GPS was used to record their location. Although the inventory did include trees slightly smaller than the 24-inch diameter trees being targeted, the inventory was reflect of the efforts back then to focus on larger trees.

The results of the inventory found 690 trees over 19 inches in diameter. Of the 690 trees inventoried, 27 percent were 19 – 23 diameter inches; 35 percent were 24 – 29 diameter inches; 17 percent were 30 – 35 diameter inches; 13 percent were 36 – 41 diameter inches; and 8 percent were 42 diameter inches and larger. The makeup of the trees found 83 percent were coniferous – of these 62 percent of the coniferous trees were cedars, 30 percent were firs, and the remaining consisted of larch, pine, redwood and sequoia trees. The inventory also noted that 71 percent of the identified trees were in good health, 22 percent in fair health, and 5 percent were in poor health. (Otak report 2002)

While there were further plans to inventory the rest of the community, this did not occur.

Because the 2002 Tree Inventory Report used a significantly different method of inventory, it would be difficult to draw a direct correlation between the 2002 report and this report so this discussion of the 2002 Tree Inventory Report is provided for historical purposes only.

6 Works Cited

- Ciecko, L., Tenneson, K., Dilley, J., & Wolf, D. K. (2012). *Seattle's Forest Ecosystem Values; Analysis of the Structure, Function, and Economic Benefits*. Seattle: City of Seattle.
- City of Medina. (2014, July 28). Chapter 20.52 Tree and Vegetation Management Code. Medina, WA.
- Dwyer, J. F., & Nowak, D. J. (1999). A national Assessment of the Urban Forest: An Overview. *Proceedings of the Society of American Foresters*, 157-162.
- Grove, J. M., O'Neil-Dunne, J., Pelletier, K., Nowak, D., & Walton, J. (2006). *A Report on New York City's Present and Possible Urban Tree Canopy*. South Burlington: USDA Forest Service, Northeastern Research Station.
- H. W. Lochner, Inc. (2013). *Interchange Justification Report: I-5/MARTIN WAY INTERCHANGE and I-5/MARVIN ROAD INTERCHANGE*. Lacey: H. W. Lochner, Inc.
- The Watershed Company. (2014). *Tree Canopy Assessment for the City of Medina*. Kirkland: The Watershed Company.
- Otak. (May 2002). *City of Medina Tree Inventory Report: Phase 1*. Prepared by Otak.

Maps

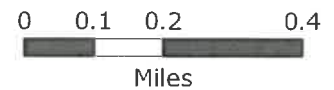
CITY OF MEDINA

TREE CANOPY ASSESSMENT

MAP 1

Overview Map

-  OHWM
-  City Boundary
-  Parcels (white)



Original scale = 1:17,500 @ 8.5" x 11" layout. Please scale accordingly.

Data Sources:
City of Medina, The Watershed Company. Foreground aerial: King County, 2012. Background aerial: USDA 2013.

All features depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation may be needed to confirm/verify information shown on this map.

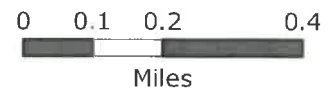
CITY OF MEDINA

TREE CANOPY ASSESSMENT

MAP 2

Estimated Evergreen Canopy Coverage

-  Less than 5%
-  10% - 25%
-  30% - 50%
-  55% - 75%
-  Greater than 80%
-  Parcels (white)



Original scale = 1:17,500 @ 8.5" x 11" layout. Please scale accordingly.

Data Sources:
City of Medina, The Watershed Company. Foreground aerial: King County, 2012. Background aerial: USDA 2013.

All features depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation may be needed to confirm/ verify information shown on this map.

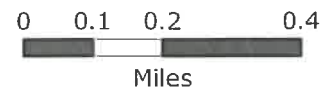
CITY OF MEDINA

TREE CANOPY ASSESSMENT

MAP 3

Estimated Deciduous Canopy Coverage

-  Less than 5%
-  10% - 25%
-  30% - 50%
-  55% - 75%
-  Greater than 80%
-  Parcels (white)



Original scale = 1:17,500 @ 8.5" x 11" layout. Please scale accordingly.

Data Sources:
City of Medina, The Watershed Company. Foreground aerial: King County, 2012. Background aerial: USDA 2013.

All features depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation may be needed to confirm/ verify information shown on this map.

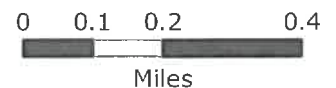
CITY OF MEDINA

TREE CANOPY ASSESSMENT

MAP 4

Estimated Combined Canopy Coverage for Evergreen and Deciduous

-  Less than 5%
-  10% - 25%
-  30% - 50%
-  55% - 75%
-  Greater than 80%
-  Parcels (white)



Original scale = 1:17,500 @ 8.5" x 11" layout. Please scale accordingly.

Data Sources:
City of Medina, The Watershed Company. Foreground aerial: King County, 2012. Background aerial: USDA 2013.

All features depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation may be needed to confirm/ verify information shown on this map.